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Dr. Middleton PHYS 132 HW

4-20-17 Ch. 22

CQ: 7

P: 16, 18, 20

Problems

22.P.16

$a = 200\lambda$

$L = 2.0m$

$w = \frac{2\lambda L}{a}$

$w = \frac{2\lambda(2.0m)}{200\lambda}$

$w = \frac{4\lambda m}{200\lambda}$

$w = \frac{1}{50} = 0.02m$

$w = 20mm$

22.P.18

$\lambda = 600\ nm$

$L = 2.0\ m$

$a = ?$

$w = 1\ cm$

$w = \frac{2\lambda L}{a}$

$a = \frac{2\lambda L}{w}$

$= \frac{2(600 \times 10^{-9} m)(2.0 m)}{(0.01 m)}$

$= 2.4 \times 10^{-4} m$ $\quad 0.24\ mm$

$= 240 \times 10^{-6} m$

$= 240\ \mu m$

$a = 0.24\ mm$

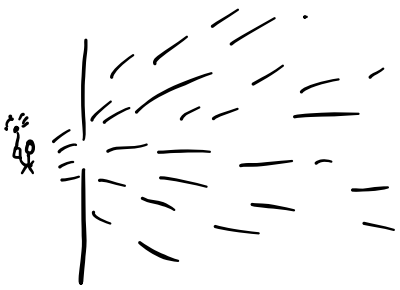
22.P.20

$f = 800\ MHz$

$a = 15m$

$\lambda = \frac{c}{f}$ $\quad c = 3.0 \times 10^8\ m/s$ $\quad f = 800 \times 10^6\ Hz$

$\lambda = 0.375m$



$d\sin\theta = m\lambda$

$\sin\theta = \frac{m\lambda}{d}$

$\theta = \sin^{-1}\left(\frac{m\lambda}{d}\right)$

$2\theta = 2\sin^{-1}\left(\frac{m\lambda}{d}\right)$

$2\theta = 2.86$

$\lambda = 0.375m$

$d = 15m$

$m = 1$

$\theta = 2.8°$

Conceptually

22.CQ.7

$$d\sin\theta_m = m\lambda$$

Fringe spacing would decrease due to λ decreasing.